Electronics Miniaturization with a System-on-a-Chip for Power Systems (PSOC)

Completed Technology Project (2012 - 2014)

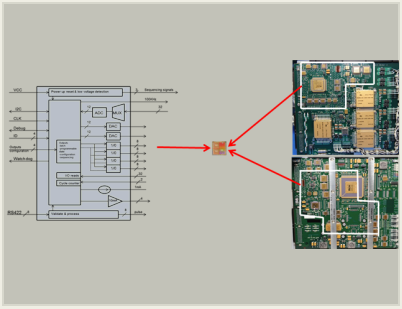
Project Introduction

This IRAD effort seeks to contribute in the research of alternatives to the reduction in volume of Power System Electronics (PSE) for the next generation of spacecraft avionics and instruments. The proposal addresses an alternative to the control support area within the PSE by exploring applicable technologies to implement PSE functions in a System-on-a-Chip (SOC). The results of this proposed first step is a definition of the PSE candidate functions to implement in a SOC, an understanding of the feasible and available technologies to provide the desired functions and an outline of the cost and schedule associated with the design and implementation of such device.

The first year objective of this multi-year project is to develop a plan to assemble the common, essential monitoring and control functions required by spacecraft and instrument power systems and implement them in a semi-custom application specific integrated circuit (ASIC), a Power System-on-a-Chip (PSOC). This approach promises at least 50% miniaturization of the presently used control circuits, to increase reliability and reduce development cost through re-use, and lower component count, while increasing robustness of spacecraft systems to extreme temperature and radiation environments.

Anticipated Benefits

This project addresses several cross-cutting technology goals including miniaturized spaceflight system, onboard processing capabilities, system robustness to extreme environments and increased cost efficiencies. A single ASIC will be able to replace an assortment of individual parts. The reduction in required circuit board area will be crucial to enable small form factor advanced mission concepts. A SOC will be part of an intelligent node capable of controlling power components, collecting and storing telemetry, and communicating with both lower level and/or higher level components in the system. Extreme environment qualification of a single ASIC will be less expensive than individual part qualification for multiple part types. After initial prototyping and qualification, systems built with this SOC will be able to replace multiple parts and part types with a single proven ASIC, reducing cost for development, testing and qualification.



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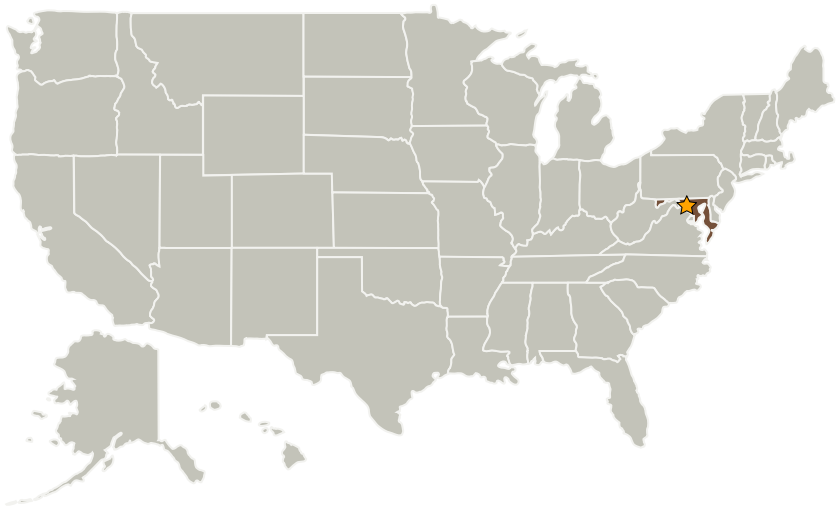
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Maryland

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Manager:

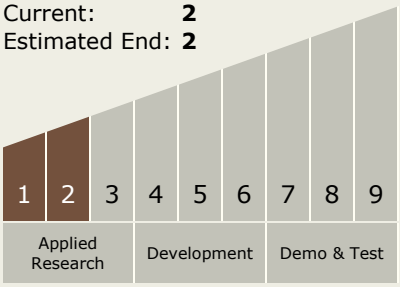
Wesley A Powell

Principal Investigator:

Amri I Hernandez-pellerano

Technology Maturity (TRL)

Start: **1**
Current: **2**
Estimated End: **2**



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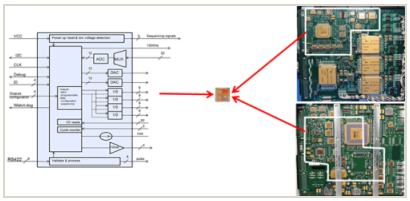
Images



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Electronics Miniaturization with a System-on-a-Chip for Power Systems
(https://techport.nasa.gov/image/3501)

Project Website:

http://aetd.gsfc.nasa.gov/

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.3 Power Management and Distribution